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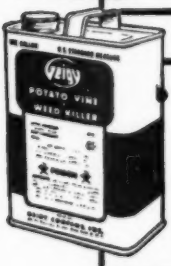

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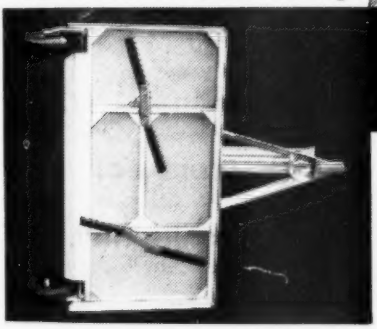

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THE INFLUENCE OF IRRIGATION ON THE NITROGEN, PHOSPHOROUS AND POTASH REQUIREMENTS OF DIFFERENT POTATO VARIETIES[1]

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(Accepted for publication, Mar. 23, 1949)

The extensive use of overhead irrigation on Long Island has led to a need for a re-examination of the various fertilizer recommendations. In 1946 a factorial experiment was begun to study three levels each of nitroge, phosphorous and potash in all combinations. These fertilizer levels were applied to four varieties of potatoes with and without irrigation. From the results of this experiment over a period of years it is hoped that adequate levels of fertilization can be determined for the major varieties of potatoes grown on irrigated farms as well as potatoes grown on farms without irrigation.

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*Refers to literature cited at end of paper.

This report is a summary of three years' results from this factorial experiment in which six varieties of potatoes have been grown.

Material and Methods

Three levels of nitrogen, 40, 80 and 120 lbs. N per acre, three levels of phosphorous, 80, 160 and 240 lbs. P_2O_5 per acre and three levels of potash, 40, 80 and 120 lbs. K_2O per acre were utilized in all combinations giving 27 fertilizer treatments. Each of two blocks was split in two, one-half receiving irrigation to provide a minimum of one inch of water per week and the other one-half receiving no water except normal rainfall. These four irrigation plots were split in 1946 into 4 plots each planted to different variety of potato. On each variety 27 plots 28 feet long and 3 rows wide were provided for the various fertilizer treatments. Thus there were 216 treatment combinations represented in two blocks.

In 1947 the experimental design was changed somewhat so that the plots were 28 feet long and 4 rows wide. Three varieties were grown and the varieties and fertilizer treatments were arranged on each irrigation plot in a 9x9 half plaid Latin square as described in detail in (1)* This same design was used in 1948 and the plots were located at the same places each year.

Varieties grown each year were as follows: 1946 Green Mountain, Mohawk, Katahdin and Sequoia; 1947 Green Mountain, Mohawk and Ontario; and 1948 Green Mountain, Katahdin and Cobbler.

Only certified seed was used and normal cultural practices were followed. Irrigation was applied twice in 1946, six times in 1947 and four times in 1948. The amounts of rainfall and irrigation for each year are given in table 1.

The fertilizer was applied in bands with an Iron Age planter modified for use in factorial experiments as described by Wessels (3). All varieties were planted on the same day and the planting dates were the 12th of April, 1946; the 16th of April, 1947; and the 21st of April, 1948. All varieties were killed on the 24th of August, 1946, the 8th of September, 1947, and the 28th of August, 1948. At these times all varieties were mature and the vines were killed to prevent second growth and to control the growth of crabgrass.

All data were subjected to the analysis of variance procedures for split plot and factorial designs. A complete description of the method is given by Jacob (1). The significant components of the interactions were determined by an extension of the method described by Kemp (2).

TABLE 1.—*Rainfall from planting to maturity by weeks after planting date and time and amount of water added by irrigation.*

(All figures are inches of water)

Week after Planting	Rainfall			Irrigation		
	1946	1947	1948	1946	1947	1948
1	0.07	0.46	0.36			
2	0.97	0.86	1.71			
3	0.05	1.59	0.92			
4	0.54*	0.24*	1.49*			
5	2.42	1.31	0.72			
6	0.49	0.32	1.69			
7	1.14	0.70	0.27			
8	2.98	0.79	1.86		1.00	
9	0.50	0.44	1.63		0.60	
10	0.14	1.74	0.07			
11	0.00	0.00	0.86	1.00	1.00	
12	1.33	0.81	1.02			1.00
13	0.07	0.81	1.03	0.70		
14	0.01	0.95	0.35		0.40	
15	1.97	0.14	0.79		0.90	0.85
16	0.88	0.79	0.17			0.80
17	6.91	0.03	0.00		0.75	1.00
18	1.74	2.19	0.00			
19	2.36	0.75				
20	0.88	0.19				
21	0.21	0.03				
22	0.00					
23	0.02					
Total	25.68	15.14	14.94	1.70	4.65	3.65
Ave. per Wk.	1.12	0.72	0.83	0.07	0.22	0.20

*Time plants emerged from ground.

RESULTS AND DISCUSSION

The year 1946 was an exceedingly favorable one for potatoes since moisture was abundant and quite well distributed, as can be seen in table 1. Consequently only twice was extra moisture in the form of irrigation considered necessary. In 1947, however, six applications were made during July and August. The early part of the 1948 season was quite wet, whereas the months of July and August were very much lacking in rainfall. These weather observations should be kept in mind when considering the results from the various years' work.

1946 EXPERIMENT

Since the percentage of potatoes in 1946 which were not U. S. No. 1 was so small, only total yields will be considered. Because of the

complex nature of the experiment the interpretation of the results will be accomplished by small main effect tables, and graphs will be used in interpreting interactions.

The analysis of variance for the 1946 data indicates that varieties differ significantly, and a very large variance is associated with nitrogen also. Although potash and the nitrogen x irrigation interaction are significantly greater than the error term, they do not differ significantly from the two significant third order interactions NKIV and PKIV. Thus they will not be discussed separately.

The average yields of the varieties are given in table 2. Further analysis confirms the observation that Katahdin and Green Mountain do not differ from one another, nor does Mohawk differ from Sequoia, but the first two average significantly higher in yield than do the latter two.

TABLE 2.—*Average total yield of different varieties over all other treatments*—1946.

Variety	Yield in Bushels per Acre
Katahdin	404
Green Mountain	374
Mohawk	347
Sequoia	334

There was a significant linear response to nitrogen on the average of all varieties (table 3). The increase in yield obtained by using 80 pounds of N compared to 40 pounds of N was not significantly different from the increase found by applying 120 pounds of N compared to 80 pounds.

TABLE 3.—*Average yields obtained from the various levels of nitrogen*—1946.

Levels of N.	Yield in Bushels per Acre
40 lbs/acre	327
80 lbs/acre	371
120 lbs/acre	396

The influence of irrigation on the nitrogen response of the different varieties at varying levels of potash is shown in figure 1. Without irrigation Katahdin responded to high nitrogen at medium potash level but not at high potash, whereas with irrigation it was necessary to provide high potash to obtain a response to high nitrogen from Katahdin. The other three varieties showed little response to high nitrogen at either level of potash without irrigation, but with irrigation they responded best to high nitrogen at the medium level of potash. At the

Figure 1. Influence of irrigation on the response of different potato varieties to nitrogen at varying levels of potash—1946

Figure 2.—Influence of irrigation on the response of different varieties to phosphorous at varying levels of potash—1946

low level of potash the nitrogen response curves of the varieties were not influenced by irrigation differently from the other two potash levels.

There was a significant influence of irrigation on the differences between the phosphorous response curves of the varieties at varying levels of potash. Without irrigation at low potash Green Mountain responded well to phosphorous, but Katahdin did not; whereas with irrigation Green Mountain was actually depressed by increased phosphorous, and Katahdin showed some benefit from large amounts. At medium potash without irrigation Green Mountain was depressed by additional phosphorous whereas Katahdin showed a benefit, but with irrigation Katahdin was depressed more markedly than was Green Mountain. At high potash the responses of both varieties were influenced the same by irrigation. Sequoia also exhibited some different effects of irrigation in the phosphorous response curves at low and medium potash compared with Green Mountain. Without irrigation at low potash, Sequoia did not respond to phosphorous, whereas Green Mountain did. At medium potash Sequoia did respond slightly to phosphorous, but Green Mountain was depressed. With irrigation and low potash both varieties were depressed by high phosphorous; Green Mountain more so than Sequoia. At medium potash the intermediate phosphorous increased Green Mountain and decreased Sequoia yields, whereas high phosphorous reversed this response (Figure 2.).

To summarize these results, without irrigation Katahdin responded best to high nitrogen and high phosphorous at the medium potash level. With irrigation the best response to high nitrogen and medium phosphorous was at high potash. In 1946, unirrigated Katahdins seemed to need 120 lbs. N, 160 lbs. P_2O_5, and 80 lbs. K_2O, but with irrigation 120 lbs. N, 160 lbs P_2O_5 and 120 lbs. K_2O constituted the best ratio.

Green Mountain responded poorly to high nitrogen without irrigation but under these conditions the best yields were obtained in the presence of high potash. With high potash, however, Green Mountain was depressed by high phosphorous. When irrigated, Green Mountain responded best to additional nitrogen at the low level of potash, and was depressed by high phosphorous at all levels of potash. Thus without irrigation Green Mountain seemed to need 120 lbs. N; 160 lbs. P_2O_5; and 120 lbs. K_2O, but with irrigation 120 lbs. N; 80 lbs. P_2O_5; and 40 lbs. K_2O were sufficient. Mohawk responded poorly to nitrogen in excess of 80 lbs. except with irrigation at medium potash. A phosphorous response was obtained without irrigation at low and high potash and with irrigation at high potash. Thus without irrigation, Mohawk seemed to need 80 lbs. N; 160 lbs. P_2O_5; and 120 lbs. K_2O, but with

irrigation 120 lbs. N; 80 lbs. P_2O_5; and 80 lbs. K_2O was the best treatment.

Sequoia responded best to 80 lbs. nitrogen at high potash without irrigation and to 120 lbs. of nitrogen at high potash with irrigation. There was little response to phosphorous, although high phosphorous was less effective at lower levels of potash. The needs of Sequoia without irrigation were 80 lbs. N; 80 lbs. P_2O_5; and 120 lbs. K_2O; but with irrigation 120 lbs. N; 240 lbs. P_2O_5; and 120 lbs. K_2O were required.

1947 Experiment

Because of the improvement in design the C. V. for 1947 was 10 per cent compared to 22 per cent for 1946. Thus many more significant differences are observed in the analysis of variance table.

All three varieties differed significantly from one another (table 4). Ontario yielded 23 bushels per acre more than Green Mountain and Green Mountain outyielded Mohawk by 73 bushels per acre. There was a significant increase in yield when nitrogen was added (table 5). However, the increase from 80 lbs. to 120 lbs. of nitrogen per acre was significantly less than the increase from 40 lbs. to 80 lbs. nitrogen per acre. Phosphorous also increased yields when raised from 80 lbs. to 160 lbs. P_2O_5 per acre, but additional phosphorous was not effective in increasing yields (table 9).

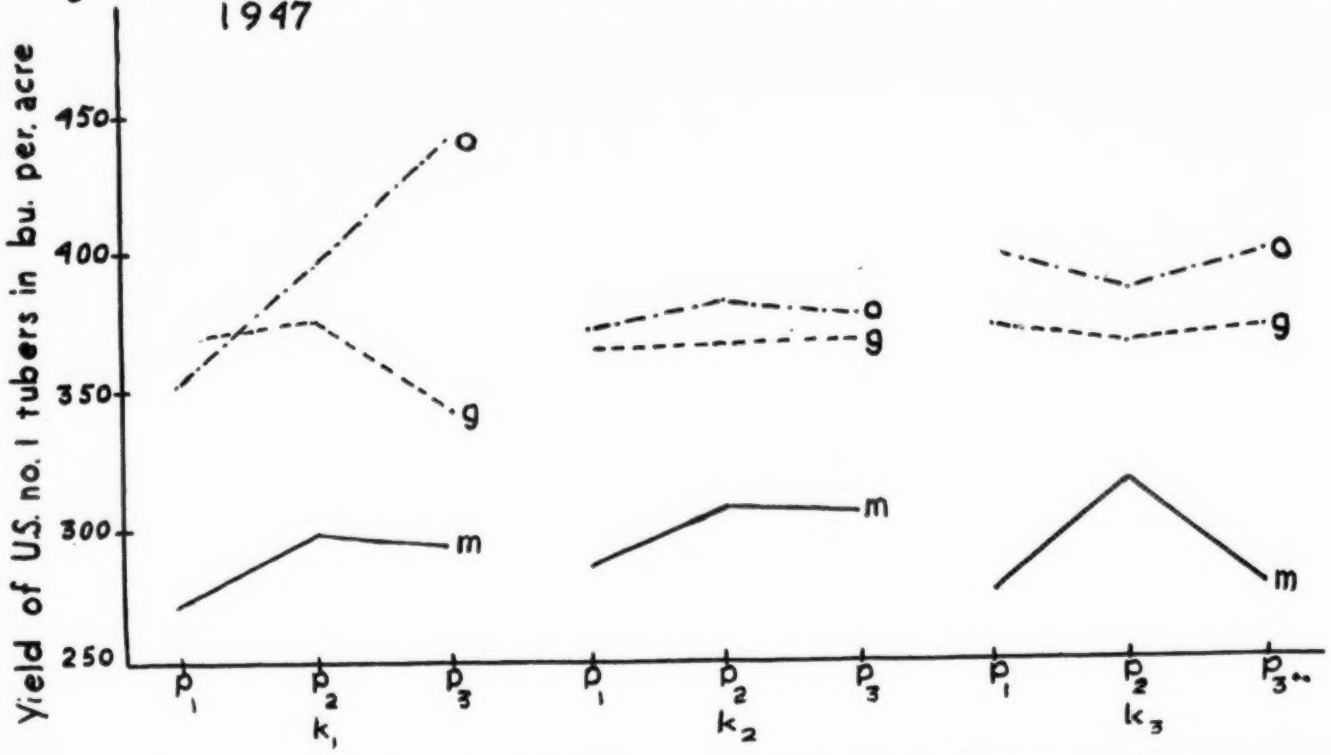
Table 4.—*Average U. S. No. 1 yields of different varieties over all other treatments*—1947.

Variety	Yield in Bushels per Acre U. S. No. 1
Ontario	388
Green Mountain	365
Mohawk	292

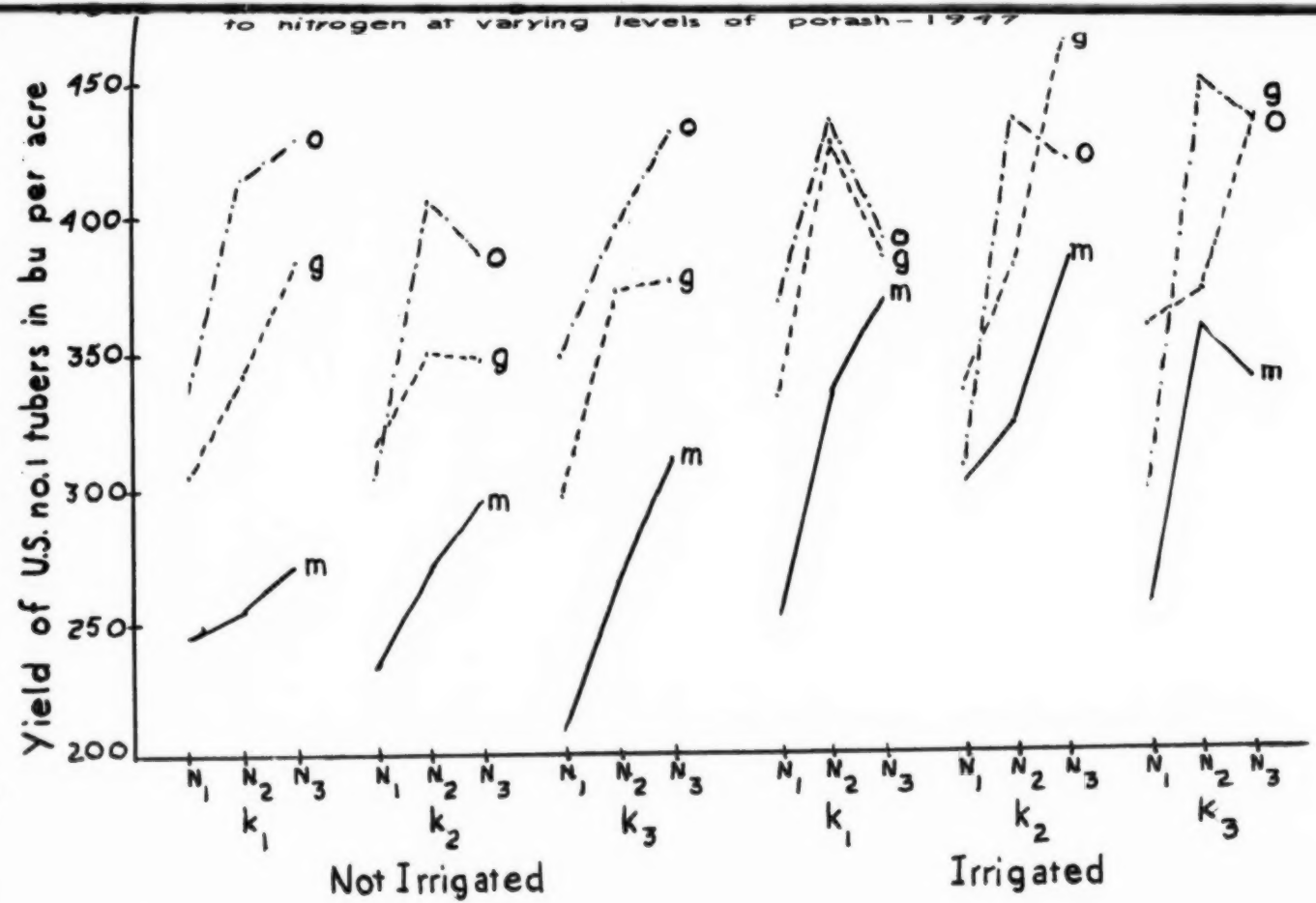
The influence of potash on the varietal response to phosphorous is shown in figure 3. At low potash Ontario responded to phosphorous applications. At high levels of potash no response was obtained. Mohawk responded to 160 lbs. P_2O_5, but not to any additional P_2O_5 and the maximum response was at high potash. Green Mountain failed to respond to phosphorous applications at any level of potash, and at a low level of potash high phosphorous actually decreased yields.

The influence of irrigation on the nitrogen response of the varieties at different levels of potash is shown in figure 4. Without irrigation Green Mountain responded to high nitrogen only at low potash, but with irrigation the maximum response to nitrogen by Green Mountain was at medium potash, athough there was a good response at high potash also. Ontario only responded to high nitrogen at high potash with-

Figure 3. Influence of potash on the varietal response to phosphorous-1947



to nitrogen at varying levels of potash – 1947



out irrigation, and with irrigation there was a good response to medium nitrogen at high potash. Without irrigation Mohawk responded best to high nitrogen at high potash, but with irrigation the best response to nitrogen was at medium potash.

TABLE 5.—*Average U. S. No. 1 yields obtained from various levels of nitrogen*—1947.

Levels of N.	Yield in Bushels per Acre U. S. No. 1
40 lbs./acre	300
80 lbs./acre	366
120 lbs./acre	380

To summarize these results, Ontario responded best to high nitrogen at high potash and also did well at low potash without irrigation, whereas the only response to phosphorous was at low potash. With irrigation 80 lbs. of nitrogen were sufficient at any level of potash. Thus without irrigation Ontario seemed to need 120 lbs. N; 240 lbs. P_2O_5; and 40 lbs. K_2O and with irrigation 80 lbs. N; 240 lbs. P_2O_5; and 40 lbs. K_2O. Green Mountain responded to high nitrogen at low potash without irrigation and with irrigation the best response was obtained at medium potash. There was no response to phosphorous. Thus for Green Mountains without irrigation the needs were 120 lbs. N; 160 lbs. P_2O_5; and 120 medium potash. There was no response to phorphorous. Thus, for Green Mountains without irrigation the needs were 120 lbs. N; 80 lbs. P_2O_5, and 40 lbs. K_2O and with irrigation 120 lbs. N; 80 lbs. P_2O_5; and 80 lbs. K_2O.

TABLE 6.—*Average U. S. No. 1 yields obtained from various levels of phosphorous*—1947.

Levels of Phosphorous P_2O_5	U. S. No. 1 Yield in Bushels per Acre
80 lbs./acre	339
160 lbs./acre	354
240 lbs./acre	352

Mohawk responded well to high nitrogen at high potash without irrigation and to high nitrogen at medium potash with irrigation. There was no phosphorous response above 160 lbs. P_2O_5. Thus for Mohawk without irrigation the needs were 120 lbs. N; 160 lbs. P_2O_5; and 120 lbs. K_2O; and with irrigation 120 lbs. N; 160 lbs. P_2O_5; and 80 lbs. K_2O.

1948 Experiment

The yields were considerably lower than corresponding yields in 1947. In table 1, it can be seen that 1948 was quite wet before emergence time and as a result considerable leaching of fertilizers took place. The latter part of the season was hot and dry so the crop matured earlier than in 1946 or 1947. The analysis of variance for the yield data showed that the error variance was low and small difference would be detected. The marked effect of nitrogen (table 7) is due in part to the heavy leaching rains early in the season, with 120 lbs. of nitrogen per acre giving a significant increase in yield over 80 lbs.

Table 7.—*Average U. S. No. 1 yields obtained from various levels of nitrogen*—1948.

Levels of Nitrogen	U. S. No. 1 Yield in Bushels per Acre
40 lbs./acre	190
80 lbs./acre	274
120 lbs./acre	307

In spite of the wet season the late application of irrigation had a significant influence on the varietal response to nitrogen at different levels of potash as shown in figure 5. Green Mountain responded to high nitrogen best at low potash without irrigation, but with irrigation the response was best at medium potash. Katahdin responded to high nitrogen at high potash without irrigation, but with irrigation the best response was obtained with low potash. Cobbler responded to high nitrogen at high potash without irrigation and with irrigation the response was the same.

There was also an influence of irrigation in the varietal response to phosphorous at different potash levels as you will note in figure 6. Cobbler responded to phosphorous at low potash with or without irrigation, but high phosphorous was best with irrigation. At other levels of potash the response was varied. Green Mountain showed no response to phosphorous except at medium potash with irrigation. Katahdin also showed best response to phosphorous at medium potash with irrigation.

In summary, without irrigation, Green Mountain responded to high nitrogen at low potash, and at this potash level there was no response to phosphorous. With irrigation the best nitrogen response was with medium potash and this level also gave some response to phosphorous. Without irrigation Green Mountain seemed to need 120 lbs. N; 80 lbs. P_2O_5; and 40 lbs. K_2O, but with irrigation 120 lbs. N; 240 lbs. P_2O_5; and 80 lbs. K_2O proved to be the best ratio.

Without irrigation Katahdin responded to nitrogen at high potash,

Figure 5. Influence of irrigation on the response of different varieties to nitrogen at different levels of potash - 1948

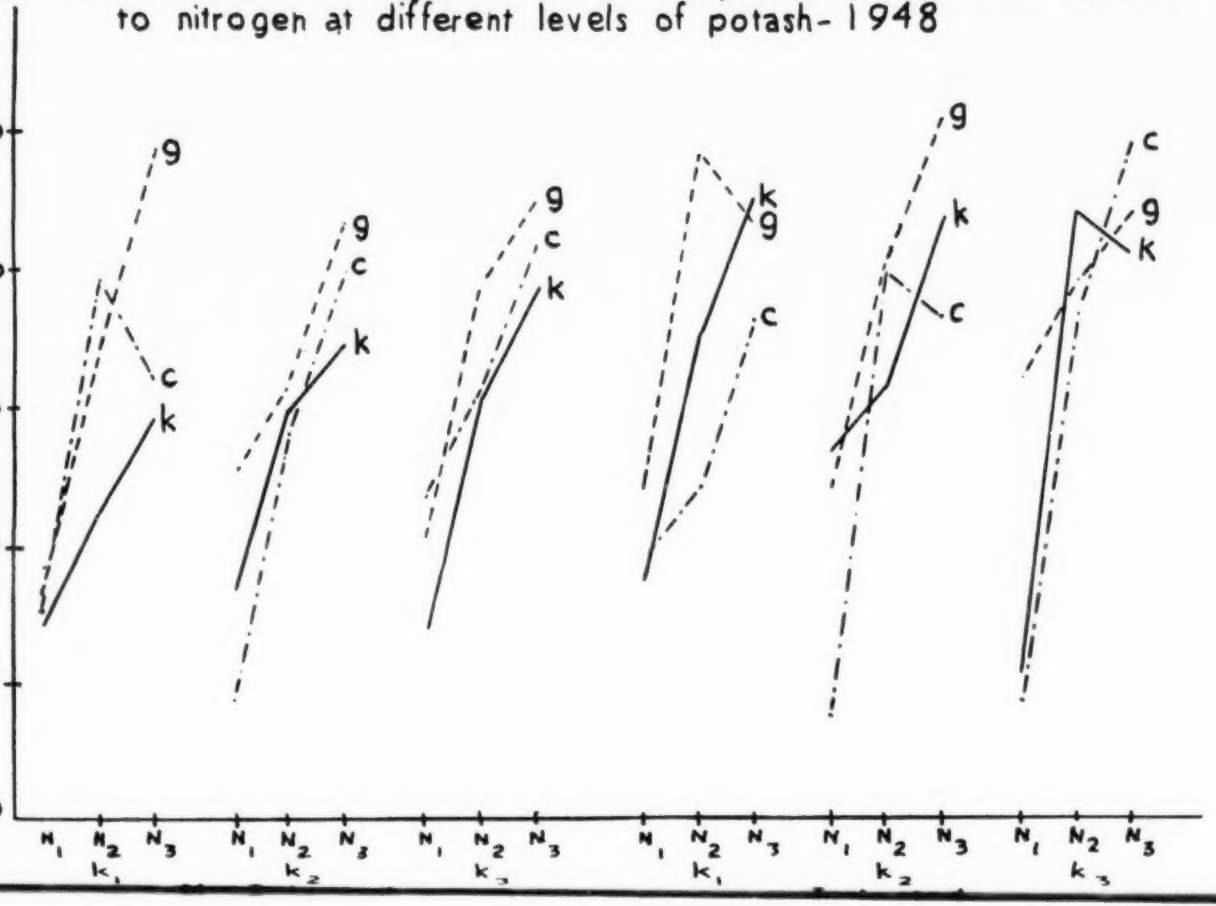
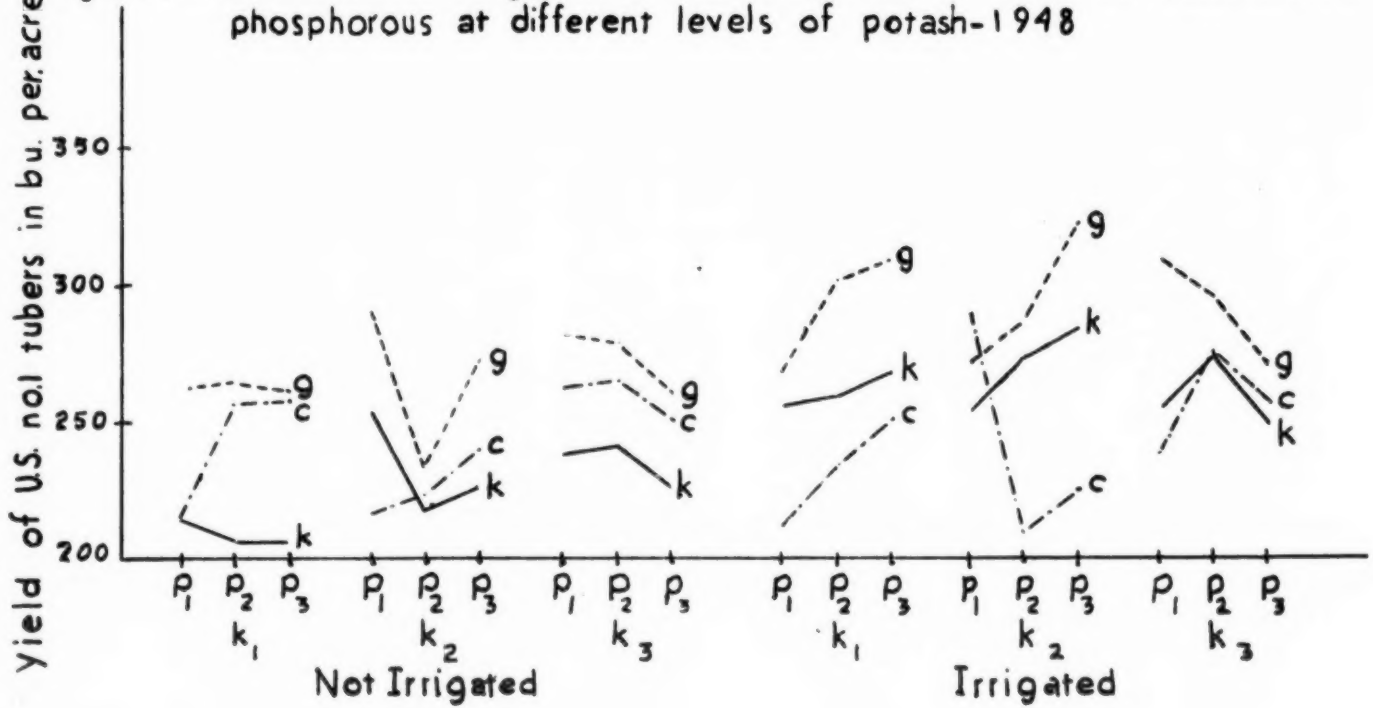


Figure 6. Influence of irrigation on the response of different varieties to phosphorous at different levels of potash-1948



and at this potash level low phosphorous was best. With irrigation the best response to nitrogen was at low potash, and at this potash level phosphorous showed very little influence. The needs for Katahdin without irrigation were 120 lbs. N; 80 lbs. P_2O_5; and 120 lbs. K_2O, but with irrigation 120 lbs. N; 80 lbs. P_2O_5; and 40 lbs. K_2O were adequate.

Cobblers without irrigation responded to high nitrogen at high potash, and at this potash level, low phosphorous was best. With irrigation high potash gave the best nitrogen response, and medium phosphorous was best here. Thus for Cobbler, the needs without irrigation were 120 lbs. N; 80 lbs. P_2O_5; and 120 lbs. K_2O but with irrigation 120 lbs. N; 160 lbs. P_2O_5; and 120 lbs. K_2O gave the best yield.

It should be pointed out that more than 120 lbs. of nitrogen seemed to be needed in some cases and in the future this change will be made. Some lowering of the phosphorous levels is indicated as well as a wider spread for potash.

Summary

1. Three years' results are reported for a 3N, 3P, 3K factorial fertilizer experiment with and without irrigation, in which 3 or 4 varieties of potatoes were grown each year.

2. Green Mountain variety was grown each year and the three years indicated a need for more than 120 lbs. of nitrogen, providing the phosphorous level is kept below 160 lbs. P_2O_5 and potash is at a low to medium level. Without irrigation about 2000 lbs. of a 6-4-2 seemed best, but with irrigation 2000 lbs. of a 66-4-4 appeared best.

3. Katahdin was grown two years. Without irrigation about 2000 lbs. of a 6-4-6 and with irrigation 2000 lbs. of a 6-4-2 were best.

4. Mohawk was tested two years. Without irrigation about 2000 lbs of a 6-8-6 and with irrigation 2000 lbs. of a 6-8-4 was best.

5. Sequoia in 1946 without irrigation did best on a ton of 4-4-6, but with irrigation a ton of 6-12-6 was best.

6. Ontario in 1947 without irrigation needed a ton of 6-12-2 and with irrigation a ton of 4-12-2.

7. Cobblers in 1948 without irrigation needed a ton of 6-4-6 and with irrigation a ton of 6-8-6.

8. Results indicated a need for changes in the levels of the N, P, and K factors for the future conduct of this experiment.

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THE EFFECT OF ZINC-CONTAINING DUSTS AND SPRAYS ON THE YIELD OF POTATOES[1]

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(Accepted for publication, May 1, 1949)

Potatoes are one of the many species of plants responding to the application of zinc. Extensive and carefully conducted water culture experiments by Schreven (12) showed that potato plants deprived of zinc were stunted and had necrotic spots on the leaflets. In severe cases local necrosis was present on the petioles and stems, and in 2 instances terminal necrosis developed. The response of potatoes to zinc-containing fertilizers has not been too favorable. Experiments by Morgan (9) in Western Australia were made to ascertain whether any effect was derived from the inclusion of certain minor elements, including zinc, in the fertilizer mixtures. His results showed that no benefit was derived as measured by yield. Rost, Kramer and McCall (11) conducted extensive potato fertilizer experiments over a period of 4 years on 40 farms located in 12 communities of the Red River Valley of Minnesota. In 1939 elaborate trials with the minor elements boron, zinc, manganese and copper were performed on 11 fields and these were repeated on one field in 1942. The treatments included the minor elements singly and in combination with all fertilizer treatments. The use of any of these minor elements either alone or in combination with fertilizer failed to increase the yield significantly. More recent research in Maine (13) compared the effect of fertilizer containing none or only trace amounts of zinc with fertilizer containing 20 pounds of zinc sulphate per acre. In 2 of the 4 experiments the potatoes yielded the same whether fertilized with zinc sulphate or not. In the remaining 2 tests zinc sulphate increased the yield by 12 bushels per acre in both experiments. In one of these tests, zinc increased yields an average of 32 bushels on the plots cropped every year to potatoes; 11 bushels on plots where potatoes were grown in alternate years with crimson clover, and only 2 bushels on plots in a similar rotation with millet.

Extensive research in certain western citrus-producing areas has demonstrated an effective method of supplying zinc to zinc-deficient

[1]Commercial grants were received from the Agricultural Supply Company, Grand Forks, North Dakota, the Rohm and Haas Company and the Tennessee Corporation.

[2]Associate Plant Pathologist, North Dakota Agricultural Experiment Station and North Dakota State Seed Department.

trees was to apply zinc-containing sprays to the leaves. Although Ellis (5) did not report zinc-deficiency symptoms on potatoes grown on Indiana muck soil, he obtained significantly higher yields in 3 of the 4 years by adding zinc sulphate to the regular copper-lime spray. He noticed that the addition of zinc sulphate to the spray imparted a bluish-green cast to the foliage and suggested that the zinc either stimulated growth or satisfied a minor element deficiency, although zinc sulphate applied to this soil had never increased yields. After using some of the new organic fungicides, Ellis (6) has recently reported that higher yields may be expected from potatoes sprayed with the zinc-containing materials Dithane D-14, Dithane Z-78 and Parzate than from those sprayed with copper fungicides, even though the degree of disease control may be the same. Somewhat similar results have been reported by Berkeley, Thompson and Richardson (1, 2) from Ontario, Canada. The addition of zinc sulphate and lime to Copper Oxychloride Sulphate, Copper-A Compound and Fermate resulted in larger yields than when these materials were used alone. A favorable response was obtained by the Rhode Island Agricultural Experiment Station (10) when cut seed pieces were dipped for 30 seconds in a solution of the zinc-containing fungicide Zerlate. Zerlate-treated seed pieces emerged earlier than those treated with 4 other materials, not containing zinc, or the check and yielded 34 bushels per acre over the check.

There are numerous conflicting reports by potato growers, research workers and others regarding the influence of various potato fungicides on yield. Hypotheses attempting to explain these yield differences have also been advanced. After 3 year's research with Bordeaux Mixture and certain new organic fungicides in Connecticut, Horsfall and Turner (8) suggested that dithiocarbamates, particularly Dithane, were not much if any better than Bordeaux Mixture in the control of late blight, but they did permit the potatoes to set a larger yield. They suggested that this was due to a lower level of phytoxicity which, in turn, was caused by a low lime content of the Dithane. Although the lime may have had some influence, it is possible that the zinc in the organic fungicides they tested was a contributing factor to the increased yields. In a recent report from Connecticut (4), Dithane- and Parzate-sprayed plots were the highest yielding of the 7 materials tested and Bordeaux Mixture, the only fungicide containing lime, ranked third. These yields were obtained during the absence of late blight and early blight. In Delaware, it is Heuberger's (7) opinion that the increased yields obtained through the use of zinc ethylene bisdithiocarbamate sprays, as well as by Zerlate when late blight is not present,

are due mainly to the fact that these fungicides are not as phytotoxic as the copper fungicides in common use.

The summaries of the National Cooperative Potato Spray Fungicide Experiments for 1947 (3) and 1948 (4) included the extensive investigations of several potato-growing states in the Midwest and East, and may be regarded as significant information with respect to the influence of some of the newer materials on yield. In 1947, plots sprayed with Dithane D-14, Parzate and Zerlate produced the highest yields in 9 states reporting no late blight. Five of the 14 cooperating states in 1948 reported no late blight and little or no early blight. A summary of the results from these 5 states showed that plots sprayed with Dithane D-14 yielded the highest followed by Parzate and Zerlate. Another zinc-containing fungicide, Copper-Zinc Chromate, ranked fourth in yield. Plots treated with Tri-Basic Copper Sulphate, Bordeaux Mixture and Copper Oxychloride Sulphate ranked fifth, sixth and seventh respectively.

The potato fungicide experiments reported in this paper were conducted at different locations in the Red River Valley of North Dakota during each of the years 1946, 1947 and 1948. Early blight, *Alternaria solani,* was absent in 1946 and first appeared on the 1947 plots on the 19th of August. The infection varied from slight to moderate on the variously treated plots at the time of the first killing frost on the 21st of September. It was not present in sufficient amount during 1948 to determine the effectiveness of the various fungicides. Late blight, *Phytophthora infestans,* appeared as a trace in 1948 and was absent the other 2 years. Under these conditions it was possible to determine the effect of the various materials applied as dusts and sprays. Zinc deficiency symptoms were never observed on the vines during this investigation and have never been reported on any crop grown in the Red River Valley of North Dakota.

Experimental Procedure and Results

Information regarding the experimental procedure is shown in table 1. Of significance was the fact that the triple lattice design was more efficient during each of the 3 years than the randomized block. Omitted from the table are climatological data at each of the 3 locations. In 1946 the soil was low in moisture during planting and remained thus until the 24th of June when 0.70 inches of rainfall was recorded. Lack of sufficient moisture during the entire growing season was the principal reason causing the low yields. The growing seasons of 1947 and 1948 were favorable for potatoes.

The common potato insects present in the Red River Valley of North Dakota are the Colorado potato beetle, *Leptinotarsa decemlineata*, the potato flea beetle, *Epitrix cucumeris*, the potato leafhopper, *Empoasca fabae*, and the 6-spotted leafhopper, *Macrosteles divisus*. To reduce the injury caused by them, DDT was used alone on certain plots and included with each fungicide. During 1946 and 1947 the tractor and attached sprayer were driven over the no-treatment plots at the time of each application in order to compensate for vine injury on the treated plots.

From the yields given in table 2 for 1946 it is evident that plots sprayed with Dithane D-14, Parzate and Dithane Z-78 were the only treatments having significant yields when compared with plot 31 which received no treatment. When compared with plot 1, receiving only 5 per cent DDT, the differences were not significant. It is of interest, however, that the 3 highest-yielding plots were sprayed with zinc-containing fungicides. Bordeaux Mixture ranked fourth and lacked 0.1 bushel of being significant at the 5 per cent level.

Further evidence supporting the preliminary 1946 results was obtained in 1947. Plot 3 was dusted with Zerlate and had a highly significant yield when compared with the plots receiving 5 per cent DDT or no treatment. The yield from the Dithane Z-78 treatment was not significant but higher than plots dusted with Copper-A Compound or Tri-Basic Copper Sulphate. Plots sprayed with Dithane D-14 and Zerlate were significantly higher than the no-treatment plot but not plot 1 which received 5 per cent DDT. A comparison of the yields obtained from plots 10 and 15 indicated that the number and time of Zerlate applications had an effect when the degree of early-blight control was the same. Plot 10 received Zerlate during the last 3 applications, and yielded 259.4 bushels or 24.7 bushels less than plot 15 which received 6 applications.

The most significant results were obtained in 1948 using Irish Cobblers fertilized with a 4-12-8 fertilizer at 440 pounds per acre. Among the 6 dust treatments, only the zinc-containing materials Zerlate, Dithane Z-78 and Parzate produced significant yields; the latter being highly significant. Six plots received fungicidal sprays and the 5 containing zinc had significant yields at the 1 per cent level. The sixth, Tri-Basic Copper Sulphate, only yielded 5.6 bushels more than the plot receiving 5 per cent DDT. In order to determine the effect of zinc sulphate alone, plots 19, 20 and 21 received this minor-element-containing chemical at different times during the season. The yield from each of the 3 plots was highly significant and comparable to some

TABLE 1.—*Details regarding the experimental procedure.*

	1946	1947	1948
Location	Grafton	Grand Forks	Northwood
Soil classification	Bearden silty clay	Bearden silt loam	Bearden very fine sandy loam
Variety	Bliss Triumph	Bliss Triumph	Irish Cobbler
Planting dates	May 21 & 22	May 14 & 15	June 10
Fertilizer and rate per acre	None	None	4-12-8 at 440 lbs.
Plot design	Triple lattice	Triple lattice	Triple lattice
Efficiency of triple lattice compared with randomized block	201 per cent	155 per cent	138 per cent
Number of treatments	16	16	16
Number of replications	6	6	6
Size of plots	2 rows wide, 80 ft. long, 2 untreated rows on each side	2 rows wide, 80 ft. long, 2 untreated rows on each side	2 rows wide, 80 ft. long, 2 untreated rows on each side
Row width	36 in.	36 in.	38 in.
Duster	2-row, tractor-mounted Niagara, 3 nozzles per row	2-row, tractor-mounted Niagara, 3 nozzles per row	2-row, tractor-mounted Niagara, 3 nozzles per row
Rate of dust per acre	35 lbs.	20 lbs. first 3 applications, 30 lbs. last 3 applications	20 lbs. first 3 applications, 40 lbs. last 3 applications
Sprayer	2-row, tractor-drawn Bean, 3 nozzles per row	2-row, tractor-drawn Bean, 3 nozzles per row	2-row, tractor-drawn Bean, 3 nozzles per row first 3 applications, 5 nozzles per row last 3 applications
Rate of spray per acre	125 gal.	100 gal. first 3 applications, 150 gal. last 3 applications	100 gal. first 3 applications, 150 gal. last 3 applications
Pressure	400 lbs.	350 lbs.	350 lbs.
Application dates, dusts and sprays	July 12 & 23, Aug. 3, 12 & 22, Sept. 3	July 15 & 31, Aug. 9, 19 & 27, Sept. 3	July 12 & 24, Aug. 2, 12 & 24, Sept. 3
First killing frost	Sept. 29	Sept. 21	Sept. 29
Harvesting dates	Oct. 2 & 3	Oct. 4-8	Oct. 12 & 13

of the zinc-containing fungicides. The influence of zinc when applied to the leaves was further demonstrated by comparing the 1948 yields from plots 25 and 27. Plot 25 received a copper-zinc mixture containing Tri-Basic Copper Sulphate and zinc sulphate furnishing 2.58 pounds of metallic copper and 0.60 pounds of metallic zinc per 100 gallons of water. Plot 27 received only Tri-Basic Copper Sulphate at the rate of 2.12 pounds of metallic copper in the same quantity of water. A highly significant yield of 30.9 bushels existed between the 2 plots in favor of the one receiving zinc sulphate.

TABLE 2.—*Adjusted mean yields in bushels per acre for the years 1946, 1947 and 1948.*

Plots	Materials	1946	1947	1948
	DUST TREATMENTS			
1[1]	5 per cent DDT	160.9 160.6	267.4	275.7
2	7 per cent HE-178 (Zinc Ethylene Bisdithiocarbamate) and 5 per cent DDT	158.6		
3	10 per cent Zerlate and 5 per cent DDT	161.6	305.0	295.7
4	6 per cent Dithane Z-78 and 5 per cent DDT		270.0	
5	8 per cent Dithane Z-78 and 5 per cent DDT			295.1
6	8 per cent Parzate and 5 per cent DDT			314.6
7	6 per cent Copper-A Compound and 5 per cent DDT	156.1	262.9	
8	7 per cent Tri-Basic Copper Sulphate and 5 per cent DDT	157.6	259.7	286.8
9	5.5 per cent Cuprocide and 5 per cent DDT			289.9
	DUST AND SPRAY TREATMENTS			
10.	5 per cent DDT first 3 applications, Zerlate and DDT 2-1-100[2] last 3 applications		259.4	
11	5 per cent DDT first 4 applications, Dithane D-14, Zinc Sulphate and DDT 2 qts. 1-1-100 last 2 applications			288.9
	SPRAY TREAMENTS			
12	Phygon and DDT 1-1-100	156.8	272.2	
13	Polyethylene Polysulfide and DDT 2 qts. 1-100	161.0		
14	Polyethylene Polysulfide, Phygon and DDT 1 qt. 1-1-100	161.2		
15	Zerlate and DDT 2-1-100		284.1	
16	Dithane D-14, Zinc Sulphate, Lime and DDT 2 qts. 1-½-1-100	173.8	288.9	
17	Dithane D-14, Zinc Sulphate and DDT. 2 qts. 1-1-100			314.3
18	Zinc Sulphate, Lime and DDT 1-½-1-100		270.4	
19	Zinc Sulphate last 3 applications and DDT 1-1-100			300.1
20	Zinc Sulphate first 3 applications and DDT 1-1-100			305.9
21	Zinc Sulphate 6 applications and DDT 1-1-100			304.8
22	Parzate[3] and DDT 2-1-100	168.9	279.0	314.6
23	Dithane Z-78[4] and DDT 2-1-100	168.9	275.3	
24	Zinc Nitrodithioacetate, Filmfast and DDT 4-½-1-100			307.9
25	Tri-Basic-Nu-Z and DDT 6-1-100			312.2
26	Copper-Zinc Chromate and DDT 2-1-100			303.9
27	Tri-Basic Copper Sulphate and DDT 4-1-100	154.0	269.0	281.3
28	Copper Oxychloride Sulphate and DDT 4-1-100		273.0	
29	Bordeaux Mixture and DDT 8-8-1-100	167.6	269.0	
30	Manganese Ethylene Bisdithiocarbamate and DDT 2-1-100	161.9		
	NO TREATMENT			
31		141.5	257.3	
	Least significant difference:			
	5 per cent level	26.2	24.5	17.5
	1 per cent level	34.9	32.6	23.3

[1]Two 5 per cent DDT treatments in 1946.

[2]All spray materials are expressed in standard units of weight or liquid measure sufficient to make 100 gallons of spray mixture. For example, Zerlate and DDT 2-1-100 means 2 pounds of Zerlate and 1 pound of DDT with sufficient water to make 100 gallons of spray mixture.

[3]Designated as Zinc Ethylene Bisdithiocarbamate in 1946.

[4]Designated as HE-178 (Zinc Ethylene Bisdithiocarbamate) in 1946.

Three copper dusts and 3 copper sprays were used at some time during the 3-year period. There was no instance where the yield from any one was significantly higher than a no-treatment plot or one receiving 5 per cent DDT. In 1946, 3 of the 4 copper-treated plots yielded less than plot 1 receiving 5 per cent DDT. Only when zinc was included in the copper-containing materials, such as Tri-Basic-Nu-Z and Copper-Zinc Chromate, were the yields among the highest.

The vines on plots treated with the zinc-containing dusts and sprays were greener at the time of the first killing frost than vines on other plots. An examination of the plants indicated the presence of considerable new foliage. Although the foliage was not weighed or the degree of color recorded, there was a positive correlation between the yields and the amount of green foliage exhibited in kodachromes taken one week previous to frost.

Summary

1. Several copper- and zinc-containing dusts and sprays were applied to potatoes during 1946, 1947 and 1948 at 3 different locations, each having a different soil type, in the Red River Valley of North Dakota.
2. No fertilizer was applied the first 2 years. In 1948 a 4-12-8 fertilizer was used at the rate of 440 pounds per acre.
3. A triple lattice design was used each year for arranging the 16 treatments, each replicated 6 times. The relative efficiency of this design, when compared with the randomized block, was 201, 155 and 138 per cent, respectively, during each of the 3 successive years.
4. Early blight, *Alternaria solani*, was absent in 1946, and varied from slight to moderate in 1947, and appeared as a very slight infection in 1948. Late blight, *Phytophthora infestans*, only appeared as a trace in 1948.
5. The injury caused by the common potato insects was reduced by using DDT.
6. The results obtained during the dry season of 1946 indicated the zinc-containing sprays may have been a factor in producing larger yields.
7. In 1947 the plot receiving Zerlate dust had a highly significant yield when compared with the no-treatment plot or the one receiving 5 per cent DDT. The yields from plots sprayed with Zerlate and Dithane D-14 were significant when compared with the no-treatment plot.
8. In 1948 plots dusted with Zerlate and Dithane Z-78 produced significant yields when compared with the 5 per cent DDT plot. The yield from the Parzate-dusted plot was highly significant.
9. The 5 plots sprayed with zinc-containing fungicides in 1948 showed highly significant yields when compared with the plot receiving 5 per cent DDT.
10. The use of zinc sulphate alone on plots 19, 20 and 21 resulted in highly significant yields when compared with plot 1.
11. Plot 25, Tri-Basic-Nu-Z, received 2.58 pounds of metallic copper and 0.60 pounds of metallic zinc in each 100 gallons of spray. Plot 27, Tri-Basic Copper Sulphate, received 2.12 pounds of metallic copper in the same quantity of spray. A highly significant difference of 30.9 bushels existed between the yields of these 2 plots in favor of the one sprayed with the zinc-containing fungicide.
12. There was no instance where the yield from a plot dusted or sprayed with a copper fungicide was significantly higher than a no-treatment plot or one receiving 5 per cent DDT.

13. When used at the rate of 1 pound per 100 gallons of water, there was no external evidence that zinc sulphate injured the foliage.
14. The results of this investigation have shown that the yields of potatoes grown in the Red River Valley of North Dakota were increased by applying zinc-containing dusts and sprays to vines that showed no external symptoms of zinc deficiency.

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THE WASECA, CHISAGO AND SATAPA POTATOES [1,2]

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The Minnesota Agricultural Experiment Station has been engaged in potato breeding work with the objective of developing for the potato growing areas of Minnesota varieties producing high yields and tubers of satisfactory market and table quality. While breeding work is also in progress on disease resistance, particularly common scab, late blight and latent mosaic, the three varieties herein described are not superior to the common varieties in this respect. They represent improvements in market and culinary quality and in adaption to the principal potato growing regions of Minnesota.

DEVELOPMENT AND ORIGIN

The three varieties were produced by outcrossing inbred lines on to the commonly grown varieties as indicated in the pedigrees, Chart 1. The inbreds were developed by cycles of selfing and crossing. The breeding plan was to develop lines breeding relatively true for the desired characters and then to cross them on adapted varieties to combine with these characters high yield and wider adaptability.

The Waseca variety was obtained by crossing the Triumph variety with an inbred selection 15-2-10. The cross was made in 1939 and the initial selections in the cross in 1940. The selection 15-2-10 bred relatively true for earliness, large attractive tubers of uniform size, with smooth shallow eyes and a thick skin or periderm. Its yield was low in comparison to commercial varieties.

Satapa was obtained from a cross of Red Warba with selection 20-4 made in 1939. The initial selections in the hybrid progeny were made in 1940. Selection 20-4 was obtained by a cycle of selfing and

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[2]These varieties are the result of potato breeding work carried on by the Minnesota Agricultural Experiment Station at University Farm, and the branch stations at Grand Rapids, Cookston and Duluth in cooperation with the State Department of Agriculture, Dairy and Food, and the Division of Fruit and Vegetable Crops and Diseases, United States Department of Agriculture.

crossing of related lines. It was medium early, and bred relatively true for uniform size per hill of exceptionally smooth, round, thick tubers.

The Chisago was produced by combining some of the best characters of the three varieties, Katahdin, Russet Burbank and Cobbler. Selection 66-1 having fertile pollen, a low set of desirable tubers was selected from a selfed progeny of the Katahdin and crossed with the Russet Burbank. From this cross an early selection was obtained, with the smoothness and inconspicuous eyes of the Russet Burbank with a lower tuber set. The yield of this selection 13-1 was slightly lower than the commercial varieties. Selection 13-1 was then crossed in 1938 with the Irish Cobbler producing a progeny from which the Chisago variety was selected.

Identifying Characteristics

Waseca

Description. Plants small to medium in size, compact to spreading; stems medium in thickness, angles inconspicuous, nodes slightly swollen, green, internodes slightly pigmented, wings inconspicuous, straight, single; stipules medium in size, spreading, green; leaves long, narrow, slightly rugose, dark green, medium to closed type; midrib green, pubescent; petioles green and pubescent; primary leaflets medium in size, ovate lobed, five pairs; petiolules green but pigmented at the base; secondary leaflets many on midrib between pairs of primary leaflets, on primary petioles, at junction of mid-rib and petioles of primary leaflets; tertiary leaflets many; inflorescence axillary, little branched, leafy bracts scarce; penduncles short, green, pigmented, pubescent; pedicels short, pigmented.

Flowers few, abscising; calyx lobe tips short to medium in length, awl shaped, green with slight pigment, pubescent; corolla small (diameter 21-23 mm.), color white with slight tinge of purple; anthers small, yellow orange; pollen scant to none, sterile; style straight, short to medium in length; stigma globose, green.

Tubers medium to large, oblong to round, medium in thickness; skin smooth, self-colored, red; eyes (medium shallow in depth) red; flesh white; sprouts red at base; maturity very early.

Chisago

Description. Plants medium to large in size, erect to spreading; stems medium to thick, angled; nodes slightly swollen, green; internodes slightly pigmented; wings prominent, wavy, double; stipules large in size, spreading, green; leaves medium in size, green, medium type; mid-

rib green, slightly pubescent; petiole green, slightly pubescent; primary leaflets large in size, ovate lobed, four pairs; petiolules green but pigmented at the base; secondary leaflets numerous, on midrib between pairs of primary leaflets, on primary leaflet petioles, at junction of midrib and petioles of primary leaflets; tertiary leaflets scarce; inflorescence on petiole, branched, leafy bracts often present sometimes forming double wings on peduncle; peduncles long, green, pigmented; pubescent; pedicel medium in length pigmented, pubescent.

Flowers many, lasting; calyx lobe tips short to long, awl shaped, green with slight pigment, pubescent; corolla medium to large (diameter 35-37 mm.) color white; anthers medium in size, orange; pollen scant, sterile; style curved, medium long; stigma globose, green.

Tubers large, oblong to round with blunt ends medium in thickness; skin smooth, white; eyes small, shallow; white; flesh white; sprouts pink at tips; maturity early.

Satapa

Description. Plants medium in size, spreading; stems thick, prominent angles; nodes only slightly swollen, green; internodes slightly pigmented, wings prominent, slightly wavy, double; stipules medium in size, spreading, green; leaves long, medium wide, rugose, dark green, closed type; midrib green, slightly pubescent; primary leaflets medium in size, ovate lobed, five pairs; petiolules green but pigmented at the base; secondary leaflets many, on midrib between pairs of primary leaflets, on primary leaflet petioles, at junction of midrib and petiole of primary leaflets; tertiary leaflets many; inflorescence axillary, little branched, leafy bracts scarce; peduncles medium in length, green, pigmented, pubescent; pedicels medium in length, pigmented, pubescent.

Flowers few, not too lasting; calyx lobe tips short to medium in length, linear, green with slight pigment, pubescent; corolla medium in size (diameter 30-32 mm.), color deep red, purple; anthers medium in size, orange; pollen scant, sterile; style straight, medium long; stigma globose, green.

Tubers medium to large, round, slightly flattened, thick short, skin smooth, self colored, pale red; eyes very shallow, red; flesh white; sprouts red at base; maturity midseason.

Adaptation and Quality

These three varieties appear to be well adapted to the potato growing areas in Minnesota. They have been tested in four distinct areas; the Red River Valley, peatland, late region, and early market region

In these tests they have yielded as well or better than the old standard commercial varieties as indicated in table 1.

TABLE 1.—*Comparative yield of potato varieties in four potato regions in Minnesota for a six-year period from* 1942-1947.

Variety	Red River Valley	Peatland	Late	Early Market	Mean
	Bus.	Bus.	Bus.	Bus.	Bus.
Extra Early					
Red Warba	201.2	198.5	171.0	242.0	203.2
Waseca	191.8	181.0	176.8	214.0	190.9
Early					
Cobbler	213.5	186.2	174.7	243.0	204.4
Triumph	174.5	165.2	167.2	173.0	170.0
Chisago	193.3	170.0	180.7	242.0	196.5
Midseason					
Chippewa	197.2	181.2	225.3	222.0	206.4
Pontiac	207.8	185.8	213.5	230.0	209.3
Satapa	208.0	198.0	228.5	238.0	218.2

The dry matter content of these three varieties is not so high as Cobbler or Red Warba; however, the cooking quality is usually considered very good. Although they are not so mealy in texture, they hold together well when boiled. The per cent dry matter is indicated in table 2.

TABLE 2.—*Dry matter and per cent of total yield of tubers over* 1⅞" *in diameter for potato varieties in Minnesota.*

	Dry Matter per Cent	Yield of Tubers over 1⅞" Diameter per Cent
Red Warba	19.2	89
Waseca	17.0	88
Cobbler	19.7	86
Triumph	18.0	88
Chisago	18.6	92
Chippewa	17.9	88
Pontiac	17.1	91
Satapa	18.0	89

A major improvement in Waseca and Chisago over the old standard varieties is in the production of more medium and large tubers as shown in table 3. In Waseca 86 per cent of the yield of U. S. #1 size tubers is over 2¼ inches compared with 83 per cent for the Red Warba. In Chisago 90 per cent is of the yield of this size compared with 84 per per cent in Cobbler and 81 per cent in Triumph. In Satapa the per cent-

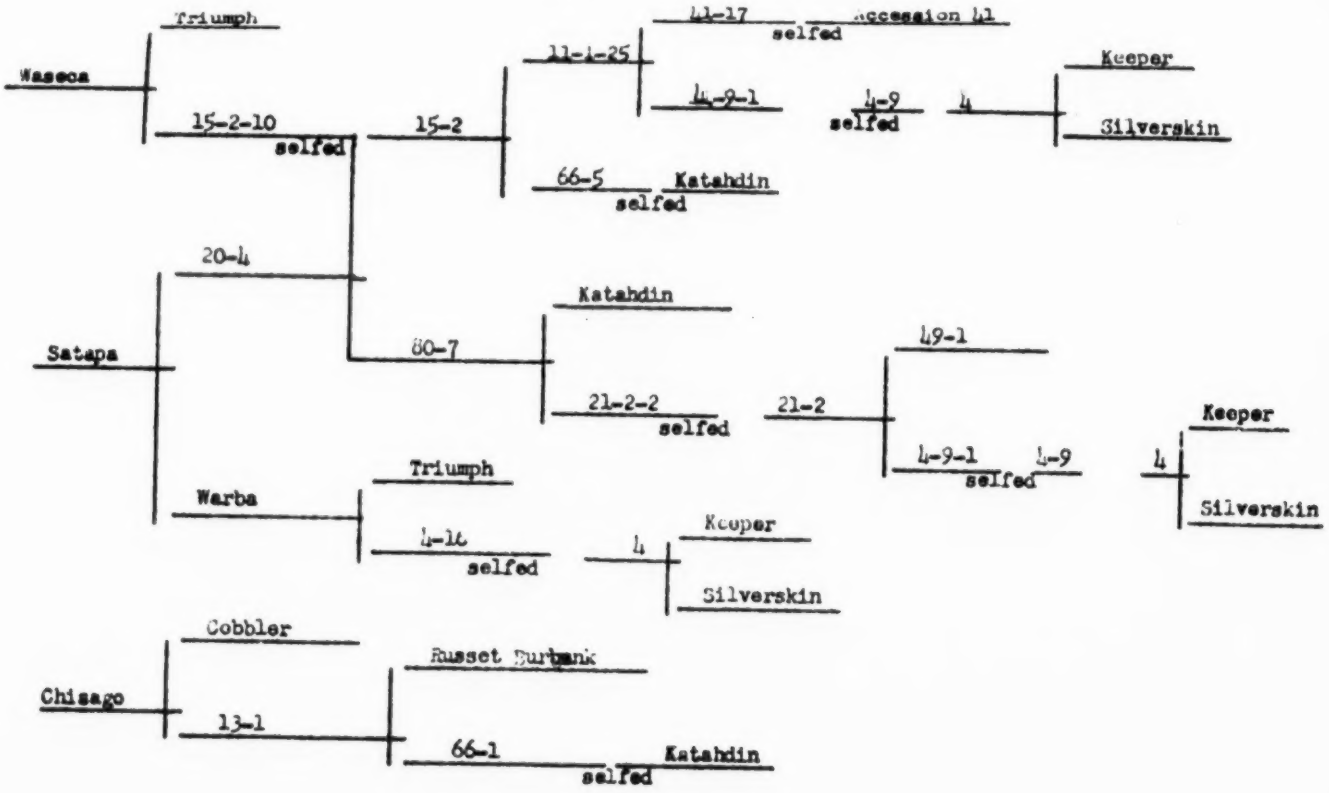
age is slightly less than in Pontiac. The greater uniformity of size which is characteristic of these new varieties is only slightly indicated in table 3. In smoothness of surface, shallowness of eyes and general desirability from a market standpoint the Waseca, Chisago, and Satapa are superior to the other varieties in their respective maturity classes. The uniformly round smooth tubers of the Satapa with very shallow eyes makes this variety particularly adapted for restaurant and hotel use where automatic peelers are used.

TABLE 3.—*Per cent of yield of U. S. No. 5 size, falling into indicated size classes.*

Variety	1⅞" - 2¼" per Cent	2¼" - 3" per Cent	Over 3" per Cent
Red Warba	16.66	69.65	13.68
Waseca	11.32	64.45	22.25
Cobbler	15.51	72.15	12.33
Triumph	18.62	73.14	8.22
Chisago	9.98	66.40	23.61
Chippewa	21.00	66.10	12.90
Pontiac	14.35	64.95	20.70
Satapa	16.47	70.40	13.12

DISSEMINATION

Sufficient seed stock of the three new potato varieties Waseca, Chisago, and Satapa will be in the hands of foundation and certified seed growers in 1949. Any one interested in procuring seed stocks of this variety should communicate with A. G. Tolaas, Potato Seed Certification, St. Paul, Minnesota.


Triumph
Waseca
15-2-10
selfed
15-2
11-17
selfed
Accession 41
11-4-25
4-9-1
4-9
selfed
4
Keeper
Silverskin
66-5
Katahdin
selfed
20-4
Katahdin
Satapa
80-7
49-1
21-2-2
selfed
21-2
4-9-1
selfed
4-9
4
Keeper
Silverskin
Triumph
Warba
4-16
selfed
4
Keeper
Silverskin
Cobbler
Chisago
13-1
Russet Burbank
66-1
Katahdin
selfed

SECTIONAL NOTES

Indiana

I have just returned from a trip in the New England States starting in Pennsylvania, going through New York, into Maine and Canada and, as you say, unless rain comes before long the crop will be rather short. We in Indiana have had a very agreeable season with timely rains and, with the exception of the past four or five days, the temperature has been very agreeable. It is somewhat warm at the present time, similar to the eastern conditions.

The early crop of potatoes is doing very well and the main or late crop looks very promising. Quite a few of the early potatoes have been harvested. The Triumph has been yielding well in our early-producing areas.

We have no report of any one starting anything in regard to price controls or allotted acreage, and if things keep on going as they are, our commercial acreage will be limited to very few growers in the extreme southern part of the state and also in the muck areas in the northern part. Our acreage is badly depleted for this year. W. B. Ward.

Missouri

Harvesting of the Jackson-Clay-Ray potato crop started the latter part of June. Yields in most cases were not as high as had been expected, with soft rot showing up in a large number of fields. The size was also below average.

Although late blight made its appearance in a number of fields it was apparently not so damaging to potato fields as was the wet weather. All specimens sent to the plant pathology department of Missouri University were not infected with late blight, and it is thought that the diseased condition was caused by excessive soil moisture.

Marketing of this year's crop has been a problem because of the percentage of rots going into the bag. Although many of the growers are grading and washing their potatoes carefully, there is still decay showing up when the potatoes reach their destination. The government buyers have purchased several cars that meet their specifications and it is probable that this year there will be many more cars sold to the government than we have sold in the past. Ben F. Vance.

New Jersey

New Jersey's worst drought for decades was finally broken on the 12th of July after a period of 42 days. The Cobbler variety has been

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seriously injured, and, as a result, many growers will harvest less than ¼ of their normal yield. Katahdins and other late-maturing varieties have been saved, although the yields will range from 25 to 50 per cent below normal.

The dry weather, being accompanied by high temperatures, caused most of the potatoes to stop growth. Consequently, the tubers went into a temporary dormant period which was quickly broken and, as a result many of these tubers have sprouted under the ground. These sprouts are to be found on all varieties and the condition is prevalent throughout the state. The sprouts range in size from buds to six inches or more in length and some are producing new plants. A condition of this type is a serious threat to the industry. The Cobbler variety is now being harvested and our growers will start harvesting the Katahdins about the 1st of August.

Many new irrigation systems have been installed and all irrigated fields, in general, will produce nearly normal yields. JOHN C. CAMPBELL.

NEW YORK

June has been much hotter than normal, and very dry. Early potatoes have suffered and the young tubers and stolons are sending out sprouts which are forming leaves. The few showers have helped, but little. Our late potatoes, however, still look good.

Our acreage is generally conceded to be within allotment. We have a fairly good "sign-up." Many growers outside the program have reduced their acreage. The prospects not too good for a normal crop.

Our State Committee expects to hold a series of meetings during July and August; a tentative draft has already been written. Because of the nearness of markets and the system of distribution our marketing agreement requirements will differ from our usual agreement, if adopted.

There is a slight increase in the acreage entered. Essex shows the biggest increase. This variety is very popular because of its vigorous growth, blight resistance, and high yielding capacity. Other blight immune varieties are being tested.

FIELD DAYS

The Empire State Potato Club Field Day, August 4, Amidon Farms, LaFayette.

Adirondack Potato Growers, August 11, Tom Norman Farm, Saranac Lake.

Steuben County Potato Growers Field Day, August—date not yet announced. H. J. EVANS.

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New York

Although most of the New York acreage was planted early and under very favorable soil conditions, the crop has suffered badly since late May for lack of rain. The prospect on Long Island is especially serious except where irrigation is available. In this area the crop was off to a good start, but since mid-May we have had no rain. This means that drought hit the Long Island crop at a very critical period. Non-irrigated fields will likely show a heavy set which in turn means undersized tubers and a low yield next fall. The conditions are almost as dry upstate, but the crop is not yet far enough along to be permanently injured by the drought. Much of the muck crop was permanently damaged by the freeze of the 8th of June.

The annual summer potato field day of the Empire State Potato Club will be held on the 4th of August on the farm of Maurice and Richard Amidon at LaFayette, New York. This site is on U. S. Route 11, about 1 mile south of the village. The Adirondack Tri - county Northern New York potato field day will be held at the farm of Thomas Norman of Saranac Lake, New York, on the 18th of August. The Steuben County Summer Potato Day is scheduled for the 20th—place to be announced.

The potato variety yield trials, including about 28 varieties, have been planted in replicated, randomized plots in Allegheny, Erie, Essex, Genesee, Nassau, Onondaga, Steuben, Suffolk and Tompkins counties. This provides a good comparison of the newer varieties because samples of the same stocks are used throughout the state. Trials with sprout inhibitors, weedicides, and chemical vine killers have been placed in several counties as a part of the research program of the Department of Vegetable Crops. Dr. W. A. Rawlins is testing soil fumigants and the residual effects of DDT, and Dr. F. M. Blodgett has instituted field experiments with the newer fungicide sprays. E. V. Hardenburg.

North Carolina

As in other sections of the Southeastern potato area, North Carolina began harvesting its crop of Irish potatoes earlier than usual this year. Early planting and a favorable growing season resulted in a proportionately earlier harvest. Practically all of the crop would have been marketed by the 25th of June if rains, during the latter part of the harvest season, had not retarded our digging operations. As a result of the recent heavy rains, a small acreage of Sebago, and in some

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areas the Cobbler variety, still remain to be harvested as of the 4th of July.

By far the majority of the crop from North Carolina moved by trucks. Both shippers and dealers have expressed greater satisfaction concerning the rapid movement by trucks. Because of the short time the potatoes are in transit, there is much less risk of spoilage. The convenience of delivery is also a point expressed in favor of trucks. Furthermore, since many of the larger trucks are equipped with refrigeration, the potatoes will arrive on the terminal markets in much better condition than when in transit for several days.

A greater amount of interest has been stimulated among the growers in washing. The cost of the machinery is still the prohibitive factor involved for most growers. Also, many of the growers in eastern North Carolina are greatly impressed by the need of a variety of Irish potato to replace the Cobbler. By next season there will possibly be a decided shift from the Cobbler to Sebago. A great deal of interest is also being shown in some of the newer blight-resistant varieties. DANIEL T. POPE.

SOUTH CAROLINA

We are constantly hearing more and more good reports about the excellent yields of quality Sebagoes and the good prices received for this variety. Most of the potato land is now in cover crops. Growers are settling up accounts past due, from the disastrous crop of 1948 and are looking forward to more washing machines and double shift operation of all washers for next year. In general, they are feeling encouraged over the future of potato productions in this area. W. G. BARNES.

PROVINCE OF CANADA

The sales of the 1948 crop of certified seed potatoes are now completed although the season lasted longer than usual. Despite the large crop produced in 1948, practically every bushel was sold.

Although completed figures for the 1949 crop entered for certification are not yet available, it would appear that the acreage will be possibly slightly less in 1949 than that inspected in 1948. In Prince Edward Island the acreage of Katahdins and Sebagoes has increased at the expense of Irish Cobblers and Green Mountains. It is interesting to note that in Saskatchewan, where potatoes are not grown very extensively, in the acreage entered for inspection approximately 70 per cent is of the Netted Gem variety. This is probably caused by the fact

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that several areas have recently been brought under an irrigation scheme.

Even though some areas have suffered from drought, in most cases the crop is reported to be in reasonably good condition and unless it continues to be very dry the crop should be quite good. Flea beetles have been reported to be quite numerous in many sections, but have not done any serious damage to date. J. W. SCANNELL.

PROVINCE OF QUEBEC

Conditions are good everywhere. Most of our insects are well under control and our prospects, generally speaking, are very good.

Our acreage is about 8 per cent less than last year.

Although the soil moisture in the Eastern townships is low, it is good elsewhere. ROGER GAGNON.

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